

DATE: 11/1/78

To: Product Manager 23 or 25 (Illegible)  
TS-767

Through: Dr. Gunter Zweig, Chief  
Environmental Fate Branch

From: Review Section No. 1  
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: <sup>1471</sup>~~4171~~ - EUP - 64 PP8G2113

Chemical: Fluridone = 1-methyl-3-phenyl-5-(3-(trifluoromethyl)phenyl)-  
4(lH)-pyridinone

Type Product: Herbicide for use in cotton

Product Name: Herbicide EL-171 AS

Company Name: Elanco Products Company

Submission Purpose: Experimental herbicide on cotton Total 205 pounds  
active ingredient. Tank mix with treflan

Date in: EFB: 9/13/78

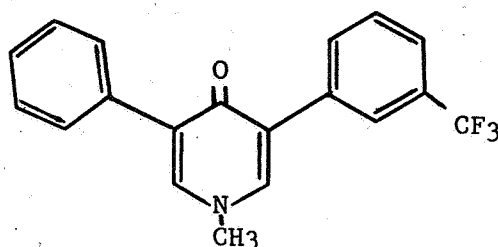
Date out: 11/1/78

1.0. Introduction

1.1 Trade Name: Fluridone; Herbicide EL-171AS

1.2 Chemical Name: 1-methyl-3-phenyl-5-(3-(trifluoromethyl)phenyl)-4(1H)-pyrididinone

1.3 Structural Formula:



1.4 The applicant requests an experimental use permit to ship 205 qts. EL-171 (205 lbs. a.i.) to be used alone and in tank mix with "Treflan" for the control of annual grasses and broadleaf weeds and perennial weedy species in cotton. The proposed program includes the use of a total of 82 acres in all cotton-producing states utilizing plots up to 20 acres in area. The applicant requests this EUP for the duration of two years.

1.5 Physical and Chemical Properties

Empirical Formula	C <sub>19</sub> H <sub>14</sub> F <sub>3</sub> NO
Molecular Weight	329.31
Color	White
Odor	Odorless
Melting Range	154 - 155° C
Vapor Pressure	less than 1x10 <sup>-7</sup> mmHg at 25°C
Partition Coefficient	log k(octanol/water):1.87
Solubility in Water	<0.5 mg/ml at ambient temp.
Sta	in aqueous suspension for at least 30 mos. at 25°C.

## Fluridone AS formulation

Density	1.120 - 1.145 gm/ml
Color	Opaque off-white liquid
Flashpoint	200°F

## Adsorption coefficients

loamy sand	3
sand	6
clay loam	11
silty clay loam	11
loam	16

## 2.0 Directions for Use:

### 2.1 EL-171 AS: Contains 4 lbs a.i./gal. (a.i.-45.2%)

Apply EL-171 as a preplant soil incorporated or surface application after planting at the following rates:

<u>Soil Texture</u>	<u>Annual grass and Broadleaf Weeds</u>		<u>Perennial Weeds</u>	
	<u>Rate (lb A/A)</u>	<u>Pts/A</u>	<u>Rate (lb A/A)</u>	<u>Pts/A</u>
Coarse	0.2 - 0.3	0.4 - 0.6	0.4 - 0.6	0.8 - 1.2
Medium	0.3 - 0.4	0.6 - 0.8	0.6 - 0.8	1.2 - 1.6
Fine	0.4 - 0.5	0.8 - 1	0.8 - 1	1.6 - 2

Surface application<sup>of</sup> perennial weeds after planting will not be effective.

### 2.2 EL-171 + "Treflan" Combination

To obtain broad spectrum control of annual grasses and broadleaf weeds, apply tank mix combinations preplant soil incorporated according to the following rates. For this tank mix, dosage rates for both "Treflan" and EL-171 have been lowered.

<u>Soil Texture</u>	<u>EL-171 (Pts/A)</u>	<u>Treflan (Pts/A)</u>
Coarse	0.4 - 0.6	0.75
Medium	0.4 - 0.6	1
Fine	0.6 - 0.8	1.25

See "Treflan" label for appropriate instructions and restrictions. Tank mix must be incorporated within 24 hours of application.

Tank mix may be applied and incorporated in the fall for annual weed control the following season.

Apply recommended rates of EL-171 or EL-171 + "Treflan" tank mix from 5 to 40 gallons of clean water per acre (broadcast basis) using a low pressure herbicide sprayer.

### 2.3 Precautions

Rotational crops planted in EL-171 treated soil may develop slight chlorosis on the lower leaves early in the growing season when EL-171 is applied broadcast. When applied in a band, any crop can be planted in rotation.

Do not plant grain sorghum, sugar beet or tomato within 18 months of application.

In all areas where EL-171 is applied at rates recommended for the control of perennial weeds, cotton must be grown the second year without EL-171 being applied as injury to other crops will result.

If a poor cotton stand occurs due to adverse weather, the land may be replanted with cotton after light tillage or in the undisturbed soil.

Over-application may result in crop injury.

#### Disposal

Rinse container thoroughly four times into spray tank and dispose of containers by burying.

### 3.0 Discussion of Data

The following environmental chemistry studies were included in this submission.

#### 3.1 Hydrolysis

Hydrolysis Study of Compound EL-171, O.D. Decker, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana, Dec. 1975, Tab I, pp. 51-48.

### Discussion of Data:

Ten ppm aqueous solutions were prepared by adding EL-171 to 0.1N HCl and 0.1N NaOH, and 6 ppm solutions were prepared at pH 3, 6, and 9.

Solutions were heated under water condensor reflux for 120 hrs. (5 days) with no detectable loss of EL-171.

### Conclusion:

All available data indicate that hydrolysis is an insignificant route of degradation for EL-171. Fluridone is stable to hydrolysis.

## 3.2 Soil Metabolism

### 3.2.1 Fluridone Residues in Soil, S.D. West, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana, April, 1978, Tab I, pp. 229-162.

#### Discussion of Data

Experimental field plots were treated with various dosages of fluridone either surface applied or preplant soil incorporated in either one or two annual applications. The  $t_{1/2}$ 's for fluridone applied at 0.3 and 0.4 lb ai/A ranged from 38 - 159 days. Half-lives in soil following soil incorporation of from 0.3 to 0.1 lb a.i./A ranged from 43 to 575 days with most values ranging around 6 months.

### 3.2.2 $^{14}\text{C}$ Fluridone Soil Degradation Studies, D.P. Rainey and J.D. Magnussen, Agricultural Biochemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana, February, 1977, Tab I, pp. 100-76.

#### Discussion of Data

The degradation rate of  $^{14}\text{C}$  Fluridone, labeled in the 4 - position of the pyridimone ring, was studied under field conditions at two applications rates, 3/8 lb a.i./A and 3/4 lb a.i./A. At the Mississippi site, the 1/2 - life of  $^{14}\text{C}$  fluridone in soil surface applied and soil incorporated was between 6 and 7 months with 15-20% of the fluridone remaining after 15 months. At the California site, 70% of the fluridone remained after 15 months. Although essentially no radioactivity was lost from the soil during this period, no metabolites were identified and no figures for bound residues appear.

- 3.2.3  $^{14}\text{C}$  Fluridone Degradation Study in Aerobic and Anaerobic Soil, D.F. Berard, Agricultural Biochemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, IN, December, 1977, Tab I, pp. 88-76.

Discussion of Data

The rate of degradation of  $^{14}\text{C}$  fluridone in soil under aerobic and anaerobic conditions was followed for 49 weeks. At the end of the study, 82 and 92% of the fluridone remained in the soil respectively. A small amount of the radioactivity was bound (5%) and a small amount was extractable residue (3%). No metabolites were identified.

- 3.2.4 Fluridone and Trifluralin Residue in Soil, S.D. West et al, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, IN, March, 1978, Tab I, pp. 161-101.

Discussion of Data

The limited amount of data reported indicate that when trifluralin is applied preplant incorporated and fluridone is surface applied together on the same plot, the degradation rates are not significantly different from those observed when the herbicides are used separately.

- 3.3.7 EL-171 for Weed Control in Cotton: Soil Residue, E.W. Day and S.D. West, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, IN 46140, December, 1975, Tab H, pp. 276-230.

Discussion of Data

Data does not differ significantly from that reviewed in 3.2.1. Half-lives ranged around 6 months with residues in coarse soils generally dissipating more quickly and those in fine soils persisting for a much greater period of time.

- 3.2.5 Conclusions: The degradation of fluridone<sup>in</sup> soil is unpredictable. Fluridone is very persistent in soils with an apparent half-life of approximately 6 months although some studies indicate that its half-life may be as long as 2 to 5 years. Degradation products also persist in the soil but are as yet uncharacterized.

3.3 Other studies included in this submission

- 3.3.1 Soil Adsorption Coefficient of Fluridone, A. Loh and G.K. Buchanan, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana, April, 1978, Tab I, pp. 75-65.

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- 3.3.2 Fluridone Soil Leaching Study, O.D. Decker, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana 46140, May, 1978, Tab I, pp. 64-52.
- 3.3.3 Photochemical Rate Studies with EL-171 in Aqueous Solution, E.W. Day and W.E. Sherman, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana 46140, December, 1975, Tab I, pp. 47-36.
- 3.3.4 The Effect of Fluridone on Nitrification, R.M. Kline, J.W. Knox, and D. Giera, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana 46140, March, 1978, Tab I, pp. 35-16.
- 3.3.5 Microbial Interactions: The Effect of Fluridone on Nitrogen Fixation, R.M. Kline and J.S. Peloso, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana 46140, May, 1978, Tab I, pp. 15-06.
- 3.3.6 n-Octanol-to-Water Partition Coefficient of Fluridone, Thomas D. Macy and A. Loh, Agricultural Analytical Chemistry, Lilly Research Laboratories, Division of Eli Lilly and Company, Greenfield, Indiana 46140, February, 1978, pp. 05-01.

3.4 All submitted data has been scanned for section 6-(a)-2 information.

#### 4.0 Conclusions

1. Hydrolysis is not a significant route of degradation for EL-171. Fluridone is stable to hydrolysis.

2. EL-171 is extremely persistent in soil with an unpredictable half life ranging from 6 months to 5 years according to the various studies submitted.

3. Studies have not been reviewed to adequacy to support registration and will be reviewed under Section 3.

#### 5.0 Recommendations

5.1 The environmental chemistry of this compound is unknown. EL-171 is deemed highly persistent at this time with a half life ranging from 6 months to 5 years. We cannot make any judgment concerning a crop rotation restriction until data is supplied indicating that residues will not be available to rotational crops.

5.2 All environmental chemistry data as required under Section 3 of the regulations will be necessary for registration.

5.3 We can go along with the following restriction.

"Do not rotate to any other crop besides cotton."

We would like to know why an 18 month crop restriction was requested for grain sorghum, sugar beet, and tomato and we would like to see any data supporting this restriction.

*Ronald E. Ney, Jr. 11/7/78*  
*Paul W. Davis 11/8/78*

Paul W. Davis

Section 1

Environmental Fate Branch

Hazard Evaluation Division

Office of Pesticide Programs

US EPA